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FRINK, JOHN MOORE	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/652,255	BASU ET AL.	
	Examiner	Art Unit	
	JOHN M. FRINK	2142	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _08 February 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-55_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-55_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _12/31/2007_.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 2/08/2008 have been fully considered but they are not persuasive.

2. Applicant beings by arguing claim 38, which was rejected under 35 USC 103, Garg in view of Li. Applicant argues that “Nowhere in this section, or elsewhere, does Garg disclose or suggest causing one or more of the nodes in the network to move to systematically remove the cutverticies from the network and form a biconnected network”. In response to this argument against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Furthermore, the movement of the nodes, as was cited in the previous and is cited in the pending office action, is shown by Li. The "removing the cutverticies from the network to form a biconnected network" claim language is clearly shown by Garg. The title of Garg, “Improved Approximation Algorithms for Biconnected Subgraphs . . .” alludes to this. Specific support can be found starting on the first line in the Abstract, which states "We consider the problems of finding minimum 2-edge connected and 2-vertex connected subgraphs in a given graph". Said “2-edge connected and 2-vertex connected" is simply another way of referring to biconnectivity, and refer to the properties that define biconnectivity.

Additionally, Section 2, discusses "The problems of 2EC and 2VC (that is, 2-

edge-conencted and 2-vertex-connected, which, as noted above, is simply another term for biconnectivity) can be posed for weighted graphs as well". Section 3, the following section, is then focused on utilizing "graph carvings" to improve on the biconnectivity solutions of Section 2. Finally, more details regarding the "removing the cutverticies from the network to form a biconnected network" can be found in section 3.1, which discusses "partition of vertices into blocks", then works removing the cut vertices ("check if u, the parent of v in T, threatens to be a cut vertex"). Also, as was noted in the previous and is noted in the present Office Action, biconnected graphs are defined by a lack of cut vertices, and thus making a graph biconnected inherently results in the removal of cut vertices.

Applicant's argument thus is not persuasive.

3. Applicant next argues that Li does not "disclose or suggest causing one or more of the nodes in the network to move systematically remove the cutverticies from the network to form a biconnected network." However, Li was not cited to teach all of this, and thus Applicant's argument is not persuasive.

4. Applicant next argues that "Li is not concerned with whether a node is biconnected." However, as Li was not cited to teach biconnectivity, Applicant's argument is not persuasive.

5. Applicant then states that Li and Garg do not show "moving one or more nodes in a determined direction and distance to transform a non-biconnected network to a biconnected network." However, Garg in view of Li were cited to teach this. Applicant argues that the Examiner cited Garg "discloses this feature". However, Garg in view of

Li were cited to show this feature, not the Garg reference alone. In response to this argument against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

6. Applicant then, in four consecutive paragraphs, repeats the argument that Garg does not "disclose or suggest determining a direction and distance to move one or more nodes". However, as was noted above, Li, not Garg was cited to show this limitation. Applicant's argument thus is not persuasive.

7. Applicant next argues that claim 49 should be allowable for the reasons argued related to claim 39, which were addressed above. Applicant's argument is unpersuasive for the reasons given above.

8. Applicant continues by arguing claim 1. Applicant first argues that "the Examiner has asserted that Templin teaches away from collectively moving nodes". However, the Examiner has made no such assertion.

9. Applicant next argues that "Nowhere in this section, or elsewhere, does Templin disclose or suggest collectively moving nodes." However, the claim language was cited to be shown by Garg in view of Li and Templin, not Templin alone. Garg was cited to show forming blocks from groups of nodes (3.1, 4.1 and 4.4). Li was cited to show moving nodes in an ad-hoc (MANET) environment to improve communication, as well as where when nodes maintain their neighbors, calculations are simplified (Sections 1, 5, and 5.1). Templin was cited to further show the desirability of minimizing node

movement as node movements results in increased transmissions cost, and breaks and otherwise changes node links ([39]). By continuing to utilize the blocks of nodes formed by Garg, and by moving nodes but seeking to maintain their neighbors, taught by Li, and where Templin further teaches that breaking/changing node relationships increases link costs and interrupts transmissions, collective block movements are taught. This minimizes the changes to node neighbors to the greatest extent possible, as advocated by Li (Section 5.1) and avoids interrupting communications as taught Templin ([39]) through maintaining the block structure taught by Garg. When the nodes move as a unit, node relationships are inherently maintained to the greatest extent possible. Furthermore, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

10. Applicant next argues claim 19 should be allowable for the reasons argued relating to claim 1. This argument is unpersuasive for the reasons given above.

11. Applicant next argues claim 21. Applicant again addresses the references individually, and states that Garg does not "disclose or suggest a movement controller, within at least one node of a plurality of nodes in a network, that is configured to identify one or more blocks, to move to make a network biconnected." However, Garg in view of Li and Templin were cited to show all of this subject matter, not merely Garg. For example, regarding the "movement controller" aspect, Garg was cited to show:

Garg shows generate a current view of the network (Garg, 3.1.1, 4.4), forming blocks from groups of one or more of the nodes in the network based on the current view of the network (Garg, 3.1, 4.1, 4.4), as well as making a network biconnected (Garg, 3.1, 4.1, 4.4).

Li was cited to show said movement controller:

Li shows in a network that includes a plurality of nodes, at least one of the nodes comprising: a network device that is capable of moving within the network; and a movement controller (Li, Section 1).

Applicant's argument that Garg, and the other references, should more of the claim than they were cited to show, thus is not persuasive.

12. Applicant next addresses page 25 – 28 of the office action, which refers to the responses to Applicant's previous arguments. Applicant argues against a "piecemeal exanimation". The Examiner disagrees with this assertion, and notes that clear reasons and motivation for combination have been provided, which have not been addressed by Applicant. Applicant's argument thus is not persuasive.

13. Applicant next argues claims 40-42, 8 and 29 and 20, stating that said claims should be allowable for the reasons previously argued. This argument is unpersuasive for the reasons addressing the previous arguments, given above.

14. Regarding claims 43 and 44, Applicant argues that Liao does not show determining a geographic center of a network. Applicant states that Liao "simply discloses selecting a gateway host of a grid as the one closest to the center of the grid". However, the "grid" discussed in the above citation is the network; thus finding the

center of said grid corresponds to finding the center of the claimed network. Liao's disclosure teaches using GPS and node communications to determine the center of said network; to find the node "closest to the center" of the network, one must know the center of the network. Applicant's arguments thus are not persuasive.

15. Applicant continues by arguing that Gibson does not show “determining weighted distances”. The cited section of Gibson, col. 5 lines 1 – 7, states that "a first relaxation step moves each node a distance determined by taking an average (weighted by distance) . . .". Applicant argues that this language does not teach determining or moving weighted distances. This argument is not persuasive. Applicant next argues that "Gibson has absolutely nothing to do with communications networks". However, Gibson was not cited to teach communication networks, merely the concept of a node moving a weighting distance. Applicant also argues “there could be no reasonable explanation" to utilize Gibson’s disclosure. However, a clear reason, unaddressed by Applicant, was provided in the previous office action:

> It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li and Laio with a that of Gibson in order to provide a route for any node to move to the center of its network, thus allowing for all nodes to move the shortest distances to improve network density and thus performance (Liao, pg. 23).

Thus, the disclosure of Gibson is relied upon to find the weighted distance a node would have to move, thus furthering the goal of the other cited art in moving the nodes the

shortest distances to improve network density, and thus performance. Applicant's arguments thus are not persusasive.

16. Applicant next argues claims 46, 47, 48, 45, stating that said claims should be allowable for the reasons previously argued. This argument is unpersuasive for the reasons addressing the previous arguments, given above.

17. Regarding claim 50, Applicant argues that Hsu and Li do not teach "determining a movement schedule for nodes using one or more linear programming techniques". However, this subject matter was cited as being shown by Hsu in view of Li. Hsu was cited to teach utilizing said linear programming for determining biconnectivity, while Li was cited to teach said movement schedule. Applicant argues that utilizing these two references amounts to a "piecemeal examination". The Examiner does not agree that utilizing these two references, with the provided motivation to combine, amounts to a "piecemeal examination".

18. Applicant next argues claim 54, arguing that Hsu does not "disclose or suggest determining a movement schedule." However, Li was cited to teach this feature, and thus Applicant's argument is not persuasive.

19. Applicant continues arguing the rejection of claim 54. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant next states that no motivation to combine Hsu and Li was given by the Examiner. However, motivation to combine said references was provided on page 23 of the previous action:

> It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Hsu with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks Mount, pg. 1).

Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to utilize the linear programming techniques of Hsu with that of Li in order to utilize an efficient solution to determining biconnectivity. Thus Applicant's argument is not persuasive.

20. Applicant concludes by arguing that claims 53 and 55 should be allowable for the reasons addressed above. This argument is unpersuasive for the reasons given above.

Claim Rejections - 35 USC § 103

1. Claims 1 – 7, 9 - 18, 21 – 28, 30 – 33 and 35 – 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over as being unpatentable over Garg et al. (Improved Approximation Algorithms for Biconnected Subgraphs via Better Lower Bounding Techniques), hereafter Garg, in view of Li et al. (Sending Messages to Mobile Users in

Disconnected Ad-hoc Wireless Networks), hereafter Li, and further in view Templin (US 2001/0040895 A1).

2. Regarding claim 1, Garg shows method for achieving biconnectivity in a network that includes a plurality of nodes, the method comprising: forming blocks from groups of one or more of the nodes in the network; selecting one of the blocks as a root block; identifying other ones of the blocks as leaf blocks; and modifying the edges to make the network biconnected (3.1, 4.1, 4.4).

Garg does not show collectivey moving the nodes in one or more of the leaf blocks to make the network biconnected.

Li shows moving nodes in an ad-hoc (MANET) environment in order to improve network communication, where the nodes are autonomous or semi-autonomous robotic nodes (Sections 1, 5), and further where when nodes maintain their neighbors, calculations are simplified (Section 5.1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

Garg in view of Li do not show where the node movements are done collectively in blocks.

Templin shows where node movement should be minimized, as it results in increased transmissions and can temporarily diminish network performance ([0039]).

It would have been obvious to further modify disclosure of Grag in view of Li with that of Templin, and thus move nodes in collective group block movements, in order to minimize overall node movement and maintain nodes neighbors to the greatest extent possible, thus decreasing transmission costs and improving network performance (Templin [0039]).

3. Regarding claim 2, Garg in view of Li and Templin further show wherein the forming blocks includes: generating a graph of a current view of a topology of the network (Li, Sections 5, 5.1), and generating a block tree based on the current view of the topology of the network, the block tree organizing the nodes into one or more blocks (Garg, 3.1.1, 4.4).

4. Regarding claims 3, Garg in view of Li and Templin further show where the generating a graph includes: determining locations of the nodes in the network, and determining the current view of the topology of the network based on the locations of the nodes in the network (Li, Sections 5, 5.1).

5. Regarding claim 4, Garg in view of Li and Templin further show where the determining locations of the nodes includes: periodically receiving updates from the nodes, each of the updates includes a location of a corresponding one of the nodes. (Li, Sections 5, 5.1).

6. Regarding claim 5, Garg in view of Li and Templin further show where the determining locations of the nodes further includes: extracting neighbor information from

the updates (Li, Section 5, where Li discloses that if you directly receive an update from a node, it is a neighbor).

7. Regarding claim 6, Garg in view of Li and Templin further show identifying cutvertices in the network (Garg, 3.1.1).

8. Regarding claim 7, Garg in view of Li and Templin further show where the collectively moving one or more (Li, Section 1, where nodes are moved to improve network performance) of the leaf blocks includes: moving one or more of the leaf blocks to remove one or more of the cutvertices from the network (Garg, 3.1.1, 3.1.2, 4.4).

9. Regarding claim 9, the collectively moving the nodes in one or more of the leaf blocks includes: moving all of the nodes within one of the leaf blocks collectively when the leaf block is moved (Li, where the leaf blocks are moved collectively to minimize messaging and transmissions costs Templin, [0039], and further where the collective movement inherently results in not changing the connectivity within the leaf block) and to simplify calculations by maintaining nodes neighbors to the greatest extent possible (Li Section 5.1)).

10. Regarding claim 10, Garg in view of Li and Templin further show where the one or more of the leaf blocks are moved while minimizing a total distance moved by all of the nodes in the network (where Templin ([0039] shows minimizing node movement along with Li (Section 1)).

11. Regarding claim 11, Garg in view of Li and Templin further show where the collectively moving the one or more nodes in of the leaf blocks includes: moving one or more of the leaf blocks, as a particular leaf block, towards a nearest node in another

one of the blocks (in order to create the biconnected network disclosed by Garg (3.1 – 3.1.2, 4.4) utilizing Templin's ([0039]) and Li's (Section 5.1) disclosures of minimizing node movement and keeping the changes of nodes neighbors minimized).

12. Regarding claim 12, Garg in view of Li and Templin further show where the particular leaf block is moved towards the nearest node until at least one new edge appears between the particular leaf block and the other one of the blocks (in order to create the biconnected network by creating/drawing edges disclosed by Garg (3.1 – 3.1.2, 4.4) utilizing Templin's ([0039]) and Li's (Section 5.1) disclosures of minimizing node movement and keeping the changes of nodes neighbors minimized).

13. Regarding claim 13, Garg in view of Li and Templin further show wherein the collectively moving (Li, Section 1, and Templin, [0039]) the nodes in one or more of the leaf blocks is performed iteratively (Garg, 3.1.1 and 3.1.2) until the network is biconnected (Garg, 1, 3.1.1).

14. Regarding claim 14, Garg in view of Li and Templin further show where the collectively moving the nodes in of one or more of the leaf blocks is performed after final positions for the one or more of the leaf blocks is determined (where Li discloses that maintaining the network structure simplifies calculations, Section 5.1).

15. Regarding claims 15 and 16, Garg in view of Li and Templin further show where the method is performed by one or more, or each of the nodes in the network (where Garg shows all nodes being considered (3.1) which enables creating the most reliable and fully optimized network).

16. Regarding claim 17, Garg in view of Li and Templin further show where the nodes are capable of moving on their own (Li, Section 1).

17. Regarding claims 18, Garg in view of Li further show where the nodes include robotic nodes (Li, Section 1).

18. Regarding claim 19, Garg shows a system for achieving biconnectivity in a network that includes a plurality of nodes comprising means for grouping the subsets of nodes into blocks and means for identifying the cutveritices in the network, and means for, over a number of iterations, removing the cutverticies from the network (3.1-3.1.2, 4.4).

Garg does not show collectively moving the subsets of nodes in or more blocks.

Li shows moving nodes in order to improve network communication, and further where when nodes maintain their neighbors, calculations are simplified (Section 5.1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

Garg in view of Li do not show where the node movements are done collectively in blocks.

Templin shows where node movement should be minimized, as it results in increased transmissions and can temporarily diminish network performance ([0039]).

It would have been obvious to further modify disclosure of Grag in view of Li with that of Templin, and thus move nodes in collective group block movements, in order to minimize overall node movement and maintain nodes neighbors to the greatest extent possible, thus decreasing transmission costs and improving network performance (Templin [0039]).

19. Regarding claim 21, Garg shows generate a current view of the network (Garg, 3.1.1, 4.4), forming blocks from groups of one or more of the nodes in the network based on the current view of the network (Garg, 3.1, 4.1, 4.4), as well as making a network biconnected (Garg, 3.1, 4.1, 4.4).

Garg does not show in a network that includes a plurality of nodes, at least one of the nodes comprising: a network device that is capable of moving within the network and a movement controller.

Li shows in a network that includes a plurality of nodes, at least one of the nodes comprising: a network device that is capable of moving within the network; and a movement controller (Li, Section 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

Garg in view of Li do not show where the node movements are done in blocks.

Templin shows where node movement should be minimized, as it results in increased transmissions and can temporarily diminish network performance ([0039]).

It would have been obvious to further modify disclosure of Grag in view of Li with that of Templin, and thus move nodes in group block movements, in order to minimize overall node movement and maintain nodes neighbors to the greatest extent possible, thus decreasing transmission costs and improving network performance (Templin [0039]).

Garg in view of Li and Templin thus show identifying one or more of the blocks, as one or more identified blocks, to move (Li, Sections 1 and 5, Templin [0039]) to make the network biconnected (Garg, 3.1, 4.1, 4.4), as well as the entirety of claim 21 as outlined above.

20. Regarding claim 22, Garg in view of Li and Templin further show where the movement controller is further configured to instruct the network device to move to a particular location when the at least one node is one of the nodes in one of the one or more identified blocks (Li, Sections 1 and 5; Garg 3.1-3.1.2 and 4.4).

21. Regarding claim 23, Garg in view of Li and Templin further show all of the nodes within the one of the one or more identified blocks move collectively (Li, where the leaf blocks are moved collectively to minimize messaging and transmissions costs Templin ([0039]) and to simplify calculations by maintaining nodes neighbors to the greatest extent possible (Li Section 5.1)).

22. Regarding claim 24, Garg in view of Li and Templin further show where the generating a graph includes: determining locations of the nodes in the network, and

determining the current view of the topology of the network based on the locations of the nodes in the network (Li, Sections 5, 5.1).

23. Regarding claim 25, Garg in view of Li and Templin further show where the determining locations of the nodes includes: periodically receiving updates from the nodes, each of the updates includes a location of a corresponding one of the nodes. (Li, Sections 5, 5.1).

24. Regarding claim 26, Garg in view of Li and Templin further show where the determining locations of the nodes further includes: extracting neighbor information from the updates (Li, Section 5, where Li discloses that if you directly receive an update from a node, it is a neighbor).

25. Regarding claim 27, Garg in view of Li and Templin further show identifying cutvertices in the network (Garg, 3.1.1).

26. Regarding claim 28, Garg in view of Li and Templin further show where when identifying one or more of the blocks to move, the movement controller is configured to identify a distance and direction to move the one or more identified blocks (Li, Section 1, where nodes are moved to improve network performance) so as to remove one or more of the cutvertices from the network (Garg, 3.1.1, 3.1.2, 4.4).

27. Regarding claim 30, Garg in view of Li and Templin further show where the movement controller is further configured to determine a distance and direction that the one or more identified blocks should move (Li, Section 1).

28. Regarding claim 31, Garg in view of Li and Templin further show where the one or more of the leaf blocks are moved while minimizing a total distance moved by all of

the nodes in the network (where Templin ([0039] shows minimizing node movement along with Li (Section 1)).

29. Regarding claim 32, Garg in view of Li and Templin further show where the moving one or more of the leaf blocks includes: moving each of the one or more of the leaf blocks, as a particular leaf block, towards a nearest node in a parent block (in order to create the biconnected network disclosed by Garg (3.1 – 3.1.2, 4.4) utilizing Templin's ([0039]) and Li's (Section 5.1) disclosures of minimizing node movement and keeping the changes of nodes neighbors minimized).

30. Regarding claim 33, Garg in view of Li and Templin further show where the particular leaf block is moved towards the nearest node until at least one new edge appears between the particular leaf block and the parent block (in order to create the biconnected network by creating/drawing edges disclosed by Garg (3.1 – 3.1.2, 4.4) utilizing Templin's ([0039]) and Li's (Section 5.1) disclosures of minimizing node movement and keeping the changes of nodes neighbors minimized).

31. Regarding claim 34, Garg in view of Li and Templin further show wherein the moving (Li, Section 1, and Templin, [0039]) the one or more identified nodes in the leaf blocks is performed iteratively (Garg, 3.1.1 and 3.1.2) until the network is biconnected (Garg, 1, 3.1.1).

32. Regarding claims 35, Garg in view of Li and Templin further show where the moving of one or more of the leaf blocks is performed after final positions for the one or more of the leaf blocks is determined (where Li discloses that maintaining the network structure simplifies calculations, Section 5.1).

33. Regarding claim 36, Garg in view of Li and Templin further show where the at least one node includes all of the nodes in the network (Garg, 3.1 – 3.1.2).

34. Regarding claim 37, Garg in view of Li further show where the nodes include robotic nodes (Li, Section 1).

35. Claims 8 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li and Templin as applied to claim 1 above, and further in view of Jennings et al. (Topology Control for Efficient Information Dissemination in Ad-hoc Networks), hereafter Jennings.

Garg in view of Li and Templin show claims 1 and 21.

Garg in view of Li and Templin do not show where the selecting one of the blocks includes, or where the movement controller is configured to identify one of the blocks that includes a maximum number of nodes as the root block.

Jennings shows identifying one of the blocks that includes a maximum number of nodes (Section III).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li and Templin with that of Jennings in order to minimize node movement (Templin [0039]) which improves performance. As disclosed in claim 1, the leaf blocks rather than the root blocks are moved, and thus the larger the root block, the smaller the leaf blocks, and the less movement occurs.

36. Regarding claim 20, Garg in view of Li and Templin show claim 19.

Garg in view of Li and Templin do not show where where the means for collectively moving includes means for moving the subset of nodes in one of the blocks toward one of the nodes in another one of the blocks.

Liao shows where, when analyzing a network and considering exploiting location information to improve network performance, increasing network density and the corresponding decrease of distance between nodes can result in improved performance (pg. 23).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li and Templin with a that of Liao in order to, when making the node movements taught by Li, locate the area of the network with the average lowest distance to other nodes, as such short distances, corresponding to node density, can improve performance (Liao pg. 23).

Garg in view of Li, Templin and Liao thus show moving includes means for moving the subset of nodes in one of the blocks toward one of the nodes in another one of the blocks, as this behavior inherently increases network desnsity and thus improves network performance, as taught by Liao.

37. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li.

38. Regarding claim 38, Garg shows a method for achieving biconnectivity in a network that includes a plurality of nodes (Garg, 1, 3.1-3.2) including generating a graph of the network (Garg, 3.1, 3.1.1) and identifying cutverticies in the network (Garg, 3.1.1,

3.1.2), as well as removing said cutverticies (3.1.1, and further where removing cutverticies to make a network biconnected is inherent, as biconnected networks inherently do not have cutverticies).

Garg does not show causing one or more of the nodes to move systemtically.

Li shows node movement in a network, and directing said node movement in order to improve network performance (Li, Section 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

39. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li.

Garg shows achieving biconnectivity in a non-biconnected network that includes a plurality of nodes, as well as transforming a non-biconnected network to a biconnected network (Garg, 3.1-3.1.2, 4.1, 4.4).

Garg does not show identifying one or more of the nodes to move (Li, Section 1); determining direction and distance to move the one or more nodes; and moving the one or more nodes in the determined direction and distance.

Li shows identifying one or more of the nodes to move (Li, Section 1); determining direction and distance to move the one or more nodes; and moving the one

or more nodes in the determined direction and distance (where Li shows changing a nodes trajectory (Section 1) along with how a node move and where a node moves to (Section 3.2), thus inherently showing 'a determined direction and distance').

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

40. Regarding claim 40, Garg in view of Li show the disclosure of claim 39.

Garg in view of Li further show forming blocks from groups of at least one of the nodes in the non-biconnected network, selecting one of the blocks as a root block, and identifying other ones of the blocks as leaf blocks (Garg, 3.1, 4.1, 4.4), as well as showing moving nodes (Li, Section 1).

Garg in view of Li do not show moving the nodes as blocks.

Templin shows where node movement should be minimized, as it results in increased transmissions and can temporarily diminish network performance ([0039]).

It would have been obvious to further modify disclosure of Grag in view of Li with that of Templin, and thus move nodes in group block movements, in order to minimize overall node movement and maintain nodes neighbors to the greatest extent possible, thus decreasing transmission costs and improving network performance (Templin [0039]).

Garg in view of Li and Templin thus show claim 40.

41. Regarding claim 41, Garg in view of Li and Templin further show where the one or more nodes are included in one or more of the leaf blocks (Garg 3.1 – 3.1.2). Regarding claim 42, Garg in view of Li and Templin further show moving the one or more nodes includes: moving the one or more nodes collectively with other ones of the one or more nodes within a same one of the leaf blocks (Li, where the leaf blocks are moved collectively to minimize messaging and transmissions costs Templin ([0039]) and to simplify calculations by maintaining nodes neighbors to the greatest extent possible (Li, Section 5.1)).

42. Claims 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li as applied to claim 39 above, of Liao et al. (GRID: A Fully Location-Aware Routing Protocol for Mobile Ad Hoc Networks), hereafter Liao, and Gibson et al. (US 6,362,821 B1), hereafter Gibson.

43. Regarding claim 43, Garg in view of Li show claim 39.

Garg in view of Li do not show determining the geographic center of the network and determining weighted distances for moving the one or more nodes to toward the geographic center.

Liao shows determining the geographic center of the network (Sections 3.1, pg.8; 3.3, pg. 15, pg. 6).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li and Templin with a that of Liao in order to locate the area of the network with the average lowest distance to other nodes,

as such short distances, corresponding to node density can improve performance (Liao pg. 23).

Garg in view of Li and Liao do not show determining the weighted distances for moving one or more nodes toward said center.

Gibson shows determining said weighted distances (Section 5, lines 1 – 7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li and Laio with a that of Gibson in order to provide a route for any node to move to the center of its network, thus allowing for all nodes to move the shortest distances to improve network density and thus performance (Liao, pg. 23).

44. Regarding claim 44, Garg in view of Li, Laio and Gibson further show where the weighted distances (Gibson col. 5 lines 1 – 7) are related to distances that the nodes are from the geographic center (Liao Sections 3.1 pg .8, 3.3 pg. 15, pg 6).

45. Claims 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li, Liao and Gibson as applied to claim 43 above, and further in view of Proctor, Jr. et al. (5,960,047), hereafter Proctor.

Garg in view of Li, Liao and Gibson show the method of claim 43.

Garg in view of Li, Liao and Gibson do not show where the direction for a particular node of the one or more nodes includes a straight line joining a starting position of the particular node and the geographic center.

Proctor shows where a straight line is the shortest distance between two points, and thus the most efficient path (col. 3 line 65 – col. 4 line 5).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li, Liao and Gibson with that of Proctor in order for the nodes to take the fastest and most efficient path when moving.

46. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li, further in view of Liao and Gibson.

Regarding claim 46, Garg shows a method for achieving biconnectivity in a non-biconnected network that includes a plurality of nodes (Garg 3.1, 3.2, 4.4).

Garg does not not show determining a geographic center of the non-biconnnected network and moving each one of one or more nodes a weighted distance towards the geographic center to transform the non-biconnected network to a biconnected network.

Li shows node movement in a network, and directing said node movement in order to improve network performance (Li, Section 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

Garg in view of Li do not show determining a geographic center of the non-biconnnected network, and though they do show node movement and transforming to a

biconnected network, they do not show moving a weighted distance towards the geographic center to transform the non-biconnected network to a biconnected network.

Liao shows a method of determining the geographic center of a network (Liao 2.4, 3.1-3.2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li with a that of Liao in order to locate the area of the network with the average lowest distance to other nodes, as such short distances, corresponding to node density, can improve performance (Liao pg. 23).

Garg in view of Li and Liao do show transformation to a biconnected network (Garg 3.1, 3.2, 4.4), node movement to improve network performance (Li, Section 1) determining a geographic center of a network along with moving nodes to said geographic center corresponding to improved performance (Liao, 2.4, 3.1-3.2), but not where said movement is done according to a weighted distance.

Gibson shows determining said weighted distances (Section 5, lines 1 – 7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li and Laio with a that of Gibson in order to provide a route for any node to move to the center of its network, thus allowing for all nodes to move the shortest distances to improve network density and thus performance (Liao, pg. 23).

47. Claim 47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li, further in view of Liao and Gibson.

Regarding claim 47, Garg show a network that includes a plurality of nodes, at least one of the nodes comprising a network device as well as determining the locations of the odes and achieving biconnectivity in the network (Garg 3.1, 3.2, 4.4).

Garg does not show a node movement or a movement controller.

Li show a movement controller including node movement in a network, and directing said node movement in order to improve network performance (Li, Section 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

Garg in view of Li do not show identifying a geographic center of the network based on the locations of the nodes.

Liao shows determining the geographic center of the network based on the locations of the nodes (Sections 3.1, pg.8; 3.3, pg. 15, pg. 6).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li with a that of Liao in order to locate the area of the network with the average lowest distance to other nodes, as such short distances, corresponding to node density, can improve performance (Liao pg. 23).

Garg in view of Li and Liao do show transformation to a biconnected network (Garg 3.1, 3.2, 4.4), node movement to improve network performance (Li, Section 1)

determining a geographic center of a network along with moving nodes to said geographic center corresponding to improved performance (Liao, 2.4, 3.1-3.2), but not where said movement is done according to a weighted distance.

Gibson shows determining said weighted distances (Section 5, lines 1 – 7).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li and Laio with a that of Gibson in order to provide a route for any node to move to the center of its network, thus allowing for all nodes to move the shortest distances to improve network density and thus performance (Liao, pg. 23).

48. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li, further in view of Liao.

Regarding claim 48, Garg shows a system for achieving biconnectivity in a non-biconnected network that includes a plurality of nodes, including transforming a non-biconnected network into a biconnected network (Garg 3.1, 3.2, 4.4).

Garg does not show means for causing each of one or more of the nodes to move.

Li shows means for causing each of one or more of the nodes to move, and directing said node movement in order to improve network performance (Li, Section 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices,

provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

Garg in view of Li do not show identifying a geographic center of the network based on the locations of the nodes.

Liao shows determining the geographic center of the network based on the locations of the nodes (Sections 3.1, pg.8; 3.3, pg. 15, pg. 6).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg in view of Li with a that of Liao in order to locate the area of the network with the average lowest distance to other nodes, as such short distances, corresponding to node density, can improve performance (Liao pg. 23).

49. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garg in view of Li.

Regarding claim 49, Garg shows achieving biconnectivity in a network that includes a plurality of nodes, determining the current topology of the network (3.1), instructions for indentifying cutverticies in the network based on the current topology of the network (3.1.1) and systematically removing cutverticies from the network and forming a biconnecting network (Garg, Section 1, 3.1.1 and 3.1.2, where Mount on pg. 1 shows where a lack of cutverticies are inherent to a biconnected network).

Garg does not show instructions for identifying one or more of the nodes in the network to move.

Li shows means for causing each of one or more of the nodes to move, and directing said node movement in order to improve network performance (Li, Section 1).

Furthermore, Li shows controlling node movement and trajectory, which inherently includes causing and controlling movement in a particular direction (Section 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Garg with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks, Mount, pg. 1).

Garg in view of Li thus show claim 49.

50. Claims 50 – 52 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu (Simpler and faster biconnectivity augmentation) in view of Li.

51. Regarding claim 50, Hsu shows a method for achieving biconnectivity in a one-dimensional non-biconnected network that includes a plurality of nodes, comprising: determining initial positions of the nodes in the one-dimensional non-biconnected network (Abstract, Section 1) as well as determining this with linear programming (Sections 1 and 3).

Hsu does not show determining a movement schedule and causing one or more of the nodes to move based on the determined movement schedule.

Li shows determining a movement schedule and causing one or more of the nodes to move based on the determined movement schedule (Section 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Hsu with that of Li in order to provide for a method

for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks Mount, pg. 1).

52. Regarding claim 51, Hsu in view of Li further show determining the movement schedule as an objective function, converting the objective function into a linear programming representation, and solving the linear programming representation optimally in polynomial time (Hsu, Abstract, Sections 1 and 3).

53. Regarding claim 52, Hsu in view of Li further show where the linear programming representation is solved as a function of a number of nodes in the one-dimensional non-biconnected network (Hsu Section 3).

Regarding claim 54, Hsu shows a system for achieving biconnectivity in a one-dimensional non-biconnected network that includes a plurality of nodes, comprising: means for determining initial positions of the nodes in the one-dimensional non-biconnected network (Hsu, Abstract, Sections 1 and 3);

means for determining a biconnectivity solution optimally in polynomial time based at least in part on the initial positions of the nodes and a number of the nodes in the one-dimensional non-biconnected network (Hsu, Abstract, Sections 1 and 3, where Hsu discloses a solution in linear time, which is inherently faster than polynomial time and thus is inclusive of any polynomial time solutions).

Hsu does not show where the biconnectivity solution includes determining a movement schedule.

Li shows determining a movement schedule for nodes and causing one or more of the nodes to move based on the determined movement schedule (Section 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Hsu with that of Li in order to provide for a method for the semi-autonomous robotic nodes of Li's disclosure to efficiently orient and network themselves in a biconnected network, which, due to the lack of cutvertices, provides a reliable network configuration (an inherent property of biconnected networks Mount, pg. 1).

21. Claims 53 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu in view of Li as applied to claims 50 and 54 above, and further in view of Lin et al. (Adaptive Clustering for Mobile Wireless Networks), hereafter Lin.

54. Regarding claim 53, Hsu in view of Li show the method of claim 50.

Hsu in view of Li do not show where each of the nodes in the biconnected network is capable of communicating with other ones of the nodes in the biconnected network one and two hops away.

Lin shows where each of the nodes in the biconnected network is capable of communicating with other ones of the nodes in the biconnected network one and two hops away (Sections 1, 2(A)).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the disclosure of Hsu in view of Li with that of Lin in order to provide for the most reliable and efficient network that allows all nodes to properly communicate.

55. Regarding claim 55, Hsu in view of Li and Lin show each of the nodes is capable of communicating with other ones of the nodes one and two hops away after biconnectivity is achieved in the one-dimensional non-biconnected network (Hsu, Sections 1-3, Lin Sections 1 and 2(A)).

Conclusion

22. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. FRINK whose telephone number is (571) 272-9686. The examiner can normally be reached on M-F 7:30AM - 5:00PM EST; off alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Andrew Caldwell can be reached on (571) 272-3868. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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